United Kingdom of Great Britain and Northern Ireland

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BS NA EN 1997-2 (2007) (English): UK National Annex to Eurocode 7. Geotechnical design. Ground investigation and testing

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NA to BS EN 1997-2:2007

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Introduction

This National Annex has been prepared by Subcommittee B/526/3, *Site investigation and ground testing.* In the UK, it is to be used in conjunction with BS EN 1997-2:2007, *Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing*.

NA.1 Scope

There are no Nationally Determined Parameters in BS EN 1997-2:2007. This National Annex contains all the information concerning the application of BS EN 1997-2:2007 in the UK.

This National Annex gives:

a) the UK decisions on the status of BS EN 1997-2:2007 informative annexes; and

b) references to non-contradictory complementary information.

NA.2 Nationally Determined Parameters

There are no Nationally Determined Parameters.

BS EN 1997-2:2007 covers the planning, carrying out and reporting of site investigations. It should be read together with complementary documents such as BS 5930:1999+A1 and BS 1377 (Parts 1 to 9) throughout.

CEN ISO/TS are Technical Specification documents and are not formal standards.

The methods described in DD CEN ISO/TS 22475-2 and DD CEN ISO/TS 22475-3 should be followed in UK practice (see BS EN 1997-2:2007, Note to **1.2**).

In the UK, laboratory tests should continue to be carried out using parts of BS 1377. DD CEN ISO/TS 17892-6 is the only laboratory test TS to be used in the UK; the other CEN ISO/TS 17892 parts are not implemented in the UK. See Table NA.1 for the part of BS 1377 to be used where CEN ISO/TS 17892 is informatively referenced in BS EN 1997-2:2007.

This National Annex does not include a comprehensive cross-referencing or comparison with the national standards.

Before designing the investigation programme, the available information and documents should be evaluated in a desk study which should also use experience in the same or similar geology from elsewhere. A desk study is required in the planning of every investigation, but the size and extent of the desk study will vary according to the project and the anticipated ground conditions.

The minimum number of laboratory tests to be carried out on a project is suggested in the BS EN 1997-2:2007 annexes. The number of tests should only be reduced on the basis of precedent experience; this experience should be included in the ground investigation report (GIR).

Table NA.1 **BS EN 1997-2:2007 Section 5 cross-references to Parts of CEN ISO/TS 17892**

BS EN 1997-2:2007 subclause	Reference in BS EN 1997-2:2007	Reference to be used in UK
5.5.1 (1) Note	BS EN 1997-2:2007 Annex M	See UK note to Annex M in **NA.3.14**.
5.5.3.1 (3) Note	CEN ISO/TS 17892-1	Use BS 1377-2:1990+A1, Clause **3**
5.5.4.1 (3) Note	CEN ISO/TS 17892-2	Use BS 1377-2:1990+A1, Clause **7**
5.5.5.1 (2) Note	CEN ISO/TS 17892-3	Use BS 1377-2:1990+A1, Clause **8**
5.5.6.1 (1) Note	CEN ISO/TS 17892-4	Use BS 1377-2:1990+A1, Clause **9**
5.5.7.1 (5) Note	CEN ISO/TS 17892-12	Use BS 1377-2:1990+A1, Clause **5**
5.8.4.1 (2) Note	CEN ISO/TS 17892-7	Use BS 1377-7:1990+A1, Clause **7**
5.8.5.1 (3) Note	CEN ISO/TS 17892-8	Use BS 1377-7:1990+A1, Clause **8**
5.8.6.1 (1) Note	CEN ISO/TS 17892-9	Use BS 1377-8:1990+A1, all Clauses
5.8.7.1 (1) Note	CEN ISO/TS 17892-10	Use BS 1377-7:1990+A1, Clause **4**
5.9.2.2 (7) Note 1	CEN ISO/TS 17892-5	Use BS 1377-5:1990+A1, Clause **3**

NA.3 Decisions on the status of informative annexes

NA.3.1 General comments

Examples of the application of test results to design are given in the annexes in BS EN 1997-2:2007. These correlations and design proposals are of interest as background and may be used. Alternative correlations and design procedures may also be used. The results from a range of tests can be used in deriving parameters and for input to design as appropriate to the site, the ground conditions and the engineering problem. The derivation of parameters from test results should be explained in the GIR. Justification of how the test results and derived values are used in design should be provided in the geotechnical design report (GDR).

Notes within the main text of BS EN 1997-2:2007 referring to annexes should be read in conjunction with the decisions in **NA.3.2** to **NA.3.25**.

NA.3.2 List of test results of geotechnical test standards, BS EN 1997-2:2007, Annex A

Annex A may be used.

NA.3.3 Planning of geotechnical investigations, BS EN 1997-2:2007, Annex B

Annex B may be used in conjunction with the following paragraph.

The recommendations of Annex B are not exhaustive and should be treated as a minimum. Relaxation of this guidance is only possible where there is sufficient previous knowledge of the ground conditions at the site or in the geological formation. The previous knowledge used in making this decision should be reported in the GIR.

NA.3.4 Example of groundwater pressure derivations based on a model and long term measurements, BS EN 1997-2:2007, Annex C

Annex C should not be used. Investigations of groundwater conditions should be carried out in accordance with BS EN ISO 22475-1.

NA.3.5 Cone and piezocone penetration tests, BS EN 1997-2:2007, Annex D

Annex D may be used subject to the general comments of **NA.3.1**.

As the new European and international standards for cone penetration test (CPT) and piezocone penetration test (CPTU) are yet to be published, testing should be carried out in accordance with BS 1377-9:1990+A2 and BS 5930:1999+A1, **26.3.3** and international test procedures (ISSMGE) [1].

A more detailed review of the use of CPT/CPTU can be found in Lunne et al [2].

NA.3.6 Pressuremeter test, BS EN 1997-2:2007, Annex E

Annex E may be used, but is only applicable to the Ménard pressuremeter and subject to the general comments of **NA.3.1**.

As the new European and international standards for the various pressuremeter types are yet to be published, the guidance in BS 5930:1999+A1, **25.7** may be used.

More details on the use of pressuremeters are given in Clark [3] and Baguelin et al [4].

NA.3.7 Standard penetration test, BS EN 1997-2:2007, Annex F

Annex F may be used subject to the general comments of **NA.3.1**.

The results of standard penetration tests (SPTs) should be included in borehole records without the application of corrections.

Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:1999+A1, Table 13.

More details on the testing technique are given in BS 5930:1999+A1 and Hepton and Gosling [5] and on the use of test results in Clayton [6].

NOTE It is recognized that it is difficult to measure the straightness of the rods to the tolerance needed. Rolling the rods on a flat surface will highlight any deflection that is likely to affect their acceptability. It is necessary to use the best available method to measure the straightness and record which method has been used.

NA.3.8 Dynamic probing test, BS EN 1997-2:2007, Annex G

Annex G may be used subject to the general comments of **NA.3.1**.

The correlations given have not been proven in UK conditions.

NA.3.9 Weight sounding test, BS EN 1997-2:2007, Annex H

Annex H should not be used.

NA.3.10 Field vane test, BS EN 1997-2:2007, Annex I

Annex I may be used subject to the general comments of **NA.3.1**.

As EN ISO 22476-9 is in preparation and is yet to be published, the guidance in BS 1377-9:1990+A2, **4.4** should be used.

Where field vane test results are included on exploratory borehole records, the values of uncorrected shear strength measured during the field vane test should be reported. Any corrections applied should be described in the GIR.

Further information on the use of field vane test results can be found in Menzies and Simons [7], and Clayton et al [8].

NA.3.11 Flat dilatometer (DMT) test, example of correlations between E_{oed} and DMT results, BS EN 1997-2:2007, Annex J

Annex J may be used subject to the general comments of **NA.3.1**.

The flat dilatometer (DMT) has seen limited exposure in the UK, but has been widely used worldwide. DD CEN ISO/TS 22476-11 gives a basic guide for the DMT, but Marchetti et al [9] gives much fuller guidance.

NA.3.12 Plate loading test, BS EN 1997-2:2007, Annex K

Annex K may be used subject to the general comments of **NA.3.1**.

As no standard is yet available, testing should be carried out in accordance with BS 1377-9:1990+A2. General guidance on testing and limitations together with use in boreholes is included in BS 5930:1999+A1, **25.6**. Guidance on the selection of plate sizes is provided in BS 1377-9:1990+A2, **4.1.2**d).

NA.3.13 Detailed information on preparation of soil specimens for testing, BS EN 1997-2:2007, Annex L

Annex L should not be used, BS 1377-1:1990+A1 should be used instead.

NA.3.14 Detailed information on tests for classification, identification and description of soil, BS EN 1997-2:2007, Annex M

Annex M should not be used.

Testing should be in accordance with BS 1377-1:1990+A1 and BS 1377-2:1990+A1. Head [10] and Head and Keeton [11] (or previous editions) provide further information. Modern methods of particle size analysis that incorporate detection systems using X-rays, laser beams, density measurements and particle counters may also be applied, in which case they should be calibrated against the standard methods. Frost susceptibility determination should follow the method in BS 812-124.

A checklist for the soil classification tests in BS EN 1997-2:2007 is given in Table NA.2.

Table NA.2 **Checklist for soil classification tests**

Classification test	Checklist
Water content	Check storage method of samples.
	Co-ordinate testing programme with other classification tests.
	Standard oven drying method is not appropriate for minerals that lose water of crystallization when heated to the standard drying temperature such as gypsum and the clay mineral halloysite; and lower drying temperature might be applicable.
	Report presence of gypsum.
	For coarse soil, correction of measured water content might be needed.
	Correction needed for saline soil.
Bulk density	Test method needs to be selected.
	Check sampling and handling methods used.
	For large earthwork projects, method might need to be adapted, or use field method.
	For sand and gravel, relative field density is from uncorrected standard penetration test (SPT N values).
Particle density	Tests are generally carried out on oven dried samples. The drying temperature can be lower if minerals that lose water of crystallization are present.
	Check whether material can have enclosed pores; for such material, special techniques might be appropriate including grinding.
	Report if material has enclosed pores.
	It can be desirable to measure the particle density separately on separate size fraction.
	If results fall outside the range of typical values, consider additional determinations; mineralogy and organic content will affect result.
Particle size analysis	Selection of test method depends on particle size and gradation.
	Organic matter influences test results; for such materials, remove organic matter if appropriate, or adapt testing method.
	Check that correct quartering is used (particle size and sample representativeness).
	Oven drying of some soils might change the properties; if this is likely, the soil should not be dried and the dry mass calculated from the test mass and water content instead.
Consistency limits (Atterberg limits)	Selection of test method for liquid limit: several methods are acceptable, but the fall cone method is recommended.
	Check the storage method of samples.
	Whenever possible, the test should be carried out on soil in its natural state.
	Where air drying is required, the method used should be stated.
	Check specimen preparation, especially homogenization and mixing.
	Check whether drying has been used.
	Drying can influence results dramatically, and should be avoided unless received water content is too high. Oven drying should be avoided.
	Soil that oxidizes should be tested quickly.
	Results need not be reliable for thixotropic soil.
Density index for coarse soil	Check storage method of samples.
	Select test type to be used.
	Results are dependent on procedure used.
	Prepared specimens have high degree of non-uniformity.
Soil dispersibility	Need to consider specifying different compaction conditions for specimens.
	Avoid drying of the specimen before testing.
	Need to select test procedures to use.
	Need to run classification tests in addition.

NA.3.15 Detailed information on chemical testing of soil, BS EN 1997-2:2007, Annex N

NA.3.15.1 General

Annex N may not be used, with the exception of **N.5**, pH value determination (acidity and alkalinity). Use the appropriate method in BS 1377-3 with the information in **NA.3.15.2** to **NA.3.15.6**.

Storage temperature before testing can influence the biological degradation of organic matter or oxidation of sulfide minerals. Whenever possible, the sample material for chemical tests should be kept at a temperature of 5 °C to 10 °C. The time between sampling and testing should be limited to reduce the likelihood of chemical change.

NA.3.15.2 Organic content determination

Sample preparation should follow the method described in BS 1377-3. Analysis of the extract should follow BS 1377-3. Modern methods of organic content analysis, such as total organic analyser, may also be used; they should be calibrated against the standard's methods. The result should be reported as the percentage of organic content in the soil sample in accordance with BS 1377-3.

NA.3.15.3 Carbonate content determination

Sample preparation should follow the method described in BS 1377-3. Analysis of the extract should follow BS 1377-3. Modern methods of carbonate content analysis such as thermogravimetric and X-ray diffraction (XRD) may also be applied, in which case they should be calibrated against the standard's methods. The result should be reported as (percentage of CO_2 in the soil sample) expressed in BS 1377-3.

NA.3.15.4 Sulfate content determination

Use BRE [12] to choose the tests to be used where the sulfate content is used to select the appropriate cement type or to investigate the likely effect on concrete. The extracts should be prepared using methods described in BS 1377-3. The analysis of the extract may be measured using methods described in BS 1377-3 (gravimetry or ion exchange). Modern methods of analysis that incorporate detection systems using chromatographic or spectroscopic methods may also be used; they should be validated against the methods in BS 1377-3. The results should be expressed as described by BS 1377-3:

- total soil sulfate (acid extract): SO_4 to the nearest 0.01%;
- 2:1 water extract sulfate: SO_4 to the nearest 0.01g/L; and
- groundwater: SO_4 to the nearest 0.01g/L.

NA.3.15.5 pH value determination

BS EN 1997-2:2007, **N.5** may be used.

NA.3.15.6 Chloride content

Sample preparation of acid and water soluble chloride of soil should follow the method described in BS 1377-3. The extract may be measured using methods described in BS 1377-3. Modern methods of analysis that incorporate detection systems using chromatographic or spectroscopic methods may also be applied; they should be validated against the method in BS 1377-3. The results should be expressed as described by BS 1377-3, as the percentage of chloride to the nearest 0.01%.

NA.3.16 Detailed information on strength index testing of soil, BS EN 1997-2:2007, Annex O

Annex O may be used.

NA.3.17 Detailed information on strength testing of soil, BS EN 1997-2:2007, Annex P

Annex P may be used. The test procedures used should be in accordance with BS 1377-7:1990+A1.

NA.3.18 Detailed information on compressibility testing of soil, BS EN 1997-2:2007, Annex Q

Annex Q may be used. The test procedures used should be in accordance with BS 1377-5:1990+A1. The coefficient of volume compressibility, m_v, should be taken as the inverse of the oedometer modulus, E_{oed}.

NA.3.19 Detailed information on compaction testing of soil, BS EN 1997-2:2007, Annex R

Annex R may be used. The test procedures used should be in accordance with BS 1377-4:1990+A2.

NA.3.20 Detailed information on permeability testing of soil, BS EN 1997-2:2007, Annex S

Annex S may be used. The test procedures used should be in accordance with BS 1377-5:1990+A1 and BS 1377-6:1990+A1.

NA.3.21 Preparation of specimen for testing on rock material, BS EN 1997-2:2007, Annex T

Annex T may be used. The test procedures used should be in accordance with ISRM [13] or ASTM D 4543-08 [14] as required.

NA.3.22 Classification testing of rock material, BS EN 1997-2:2007, Annex U

Annex U may be used. The test procedures used should be in accordance with ISRM [13].

NA.3.23 Swelling testing of rock material, BS EN 1997-2:2007, Annex V

Annex V may be used. The test methods are described in ISRM [13]. These tests are also applicable to firm or stiffer fine-grained soils, as described in BS 1377-5:1990+A1.

NA.3.24 Strength testing of rock material, BS EN 1997-2:2007, Annex W

Annex W may be used, with the exception of **W.1.1**.

The tests listed in **W.1.1** should be carried out in accordance with ISRM [15] or ASTM D 7012-07 [16], or ASTM D 5731-07 [17].

NA.3.25 Bibliography, BS EN 1997-2:2007, Annex X

Annex X should be used.

NA.4 References to non-contradictory complementary information

BS 5930:1999+A1:2007, *Code of practice for site investigations.* [1)]

NA.5 Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 812-124, *Testing aggregates – Part 124: Method for determination of frost-heave*

BS 1377-1, *Methods of test for Soils for civil engineering purposes – Part 1: General requirements and sample preparation*

BS 1377-2:1990+A1:1996, *Methods of test for Soils for civil engineering purposes – Part 2: Classification tests*

BS 1377-3, *Methods of test for Soils for civil engineering purposes – Part 3: Chemical and electro-chemical tests*

BS 1377-4, *Methods of test for Soils for civil engineering purposes – Part 4: Compaction related tests*

BS 1377-5:1990+A1:1994, *Methods of test for Soils for civil engineering purposes – Part 5: Compressibility, permeability and durability tests*

BS 1377-6, *Methods of test for Soils for civil engineering purposes – Part 6: Consolidation and permeability tests in hydraulic cells and with pore pressure measurement*

BS 1377-7:1990+A1:1994, *Methods of test for Soils for civil engineering purposes – Part 7: Shear strength tests (total stress)*

1) Under revision to remove superseded information and any text conflicting with BS EN 1997-2.

BS 1377-8:1990+A1:1994, *Methods of test for Soils for civil engineering purposes – Part 8: Shear strength tests (effective stress)*

BS 1377-9:1990+A2:2007, *Methods for test for Soils for civil engineering purposes – Part 9: In-situ tests*

BS 5930:1999+A1:2007, *Code of practice for site investigations*

BS EN 1997-2:2007, *Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing*

BS EN ISO 22475-1, *Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution*

DD CEN ISO/TS 17892-6, *Geotechnical investigation and testing – Laboratory testing of soil – Part 6: Fall cone test*

DD CEN ISO/TS 22475-1, *Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution*

DD CEN ISO/TS 22475-2, *Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 2: Qualification criteria for enterprises and personnel*

DD CEN ISO/TS 22475-3, *Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 3: Conformity assessment of enterprises and personnel by third party*

DD CEN ISO/TS 22476-11, *Geotechnical investigation and testing – Field testing – Part 11: Flat dilatometer test*

CEN ISO/TS 17892-1, *Geotechnical investigation and testing – Laboratory testing of soil – Part 1: Determination of water content*[2)]

CEN ISO/TS 17892-2, *Geotechnical investigation and testing – Laboratory testing of soil – Part 2: Determination of density of fine-grained soil*[2)]

CEN ISO/TS 17892-3, *Geotechnical investigation and testing – Laboratory testing of soil – Part 3: Determination of particle density – Pycnometer method*[2)]

CEN ISO/TS 17892-4, *Geotechnical investigation and testing – Laboratory testing of soil – Part 4: Determination of particle size distribution*[2)]

CEN ISO/TS 17892-5, *Geotechnical investigation and testing – Laboratory testing of soil – Part 5: Incremental loading oedometer test*[2)]

CEN ISO/TS 17892-7, *Geotechnical investigation and testing – Laboratory testing of soil – Part 7: Unconfined compression test on fine-grained soil*[2)]

CEN ISO/TS 17892-8, *Geotechnical investigation and testing – Laboratory testing of soil – Part 8: Unconsolidated undrained triaxial test*[2)]

CEN ISO/TS 17892-9, *Geotechnical investigation and testing – Laboratory testing of soil – Part 9: Consolidated triaxial compression tests on water saturated soil*[2)]

CEN ISO/TS 17892-10, *Geotechnical investigation and testing – Laboratory testing of soil – Part 10: Direct shear tests*[2)]

[2)] Not adopted in the UK.

CEN ISO/TS 17892-12, *Geotechnical investigation and testing – Laboratory testing of soil – Part 12: Determination of Atterberg limits*[3)]

prEN ISO 22476-9, *Geotechnical investigation and testing – Field testing – Part 9: Field vane test*[4)]

Other publications

[1] International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). International reference test procedure for the cone penetration test (CPT) and the cone penetration test with pore pressure (CPTU). Report of ISSMGE Technical Committee on ground property characterisation from in-situ testing. *Proc. XIIth ECSMGE*, pp 2195-2222. Rotterdam: Balkema, 1999.

[2] Lunne, T., Robertson, P.K. and Powell, J.J.M. *Cone penetration testing in geotechnical practice*. Abingdon, Routledge, 1997.

[3] Clarke, B.G. *Pressuremeters in geotechnical design*. London: Blackie Academic and Professional, 1994.

[4] Baguelin, F., Jezequel, J.F. and Shields, D.H. *The Pressuremeter and Foundation Engineering*. Clausthal-Zellerfeld, Germany: Trans Tech Publication, 1978.

[5] Hepton, P. and Gosling, D. The Standard penetration Test in the UK after Eurocode 7: Amendment to BS 1377: Part 9: 1990, *Ground Engineering*, 2008. Volume 41; Number 11, pp 16-21.

[6] Clayton, C.R.I. *The standard penetration test (SPT): methods and use.* Report 143. London: CIRIA, 1995.

[7] Menzies, B.K. and Simons, N.E. *Stability of embankments on soft ground*. Developments in Soil Mechanics 1. London: Applied Science Publishers Ltd., 1978.

[8] Clayton, C.R.I., Simons, N.E. and Matthews, M.C. *Site Investigation*. London: Granada, 1982.

[9] International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). Marchetti S., Monaco, P., Totani, G. & Calabrese, M. The Flat Dilatometer Test (DMT) in soil investigations. A Report by the ISSMGE Committee TC16. *Proc. IN SITU 2001, Int. Conf. On In-situ Measurement of Soil Properties*, Bali, Indonesia: 2001.

[10] Head, K. H. *Manual Of Soil Laboratory Testing / Soil Classification And Compaction Tests* Pt. 1. Third Edition. Dunbeath: Whittles Publishing, 2008.

[11] Head, K.H. and Keeton, P. *Manual of Soil Laboratory Testing: Permeability, Shear Strength and Compressibility Tests* Pt. 2. Dunbeath: Whittles Publishing, 2009.

[12] Building Research Establishment (BRE). Special Digest 1: Third Edition. *Concrete in aggressive ground*, Watford: BRE, 2005.

[13] International Society for Rock Mechanics (ISRM). *Suggested Methods for Rock Characterization, Testing and Monitoring*. Ed. E.T. Brown. Oxford: Pergamon Press, 1981.

3) Not adopted in the UK.

4) Document in preparation.

[14] ASTM D 4543-08. *Preparing Rock Core Specimens and Determining Dimensional and Shape Tolerances.* ASTM Volume 04.08 *Soils and Rock*. Philadelphia, USA: American Society for Testing and Materials, 2008.

[15] International Society for Rock Mechanics (ISRM), Suggested Methods for Determining Point Load Strength. *International Society for Rock Mechanics, Mining Sciences and Geomechanical Abstracts*, 1985, Vol.22, 2, pp52-60.

[16] ASTM D 7012-07. *Standard Test Method for Compressive Strength and Elastic Moduli of intact Rock Core Specimens under Varying States of Stress and Temperature.* ASTM Volume 4.09 *Soil and Rock II*. Philadelphia, USA, American Society for Testing and Materials, 2009.

[17] ASTM D 5731-07. *Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classification.* ASTM Volume 04.08 *Soils and Rock*. Philadelphia, USA, American Society for Testing and Materials, 2008.

Further reading

Site Investigation Steering Group. Site Investigation in Construction, *Part 2, Planning, procurement and quality management*. London: Thomas Telford, 1993. [5)]

Head, K. H. *Manual of soil laboratory testing. Vol. 2. Permeability, shear strength and compressibility tests*. Second edition. London: Pentech Press, 1994.

[5)] Being revised in 2010.

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